UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON D.C., 20460

OFFICE OF **C**HEMICAL **S**AFETY
AND **P**OLLUTION **P**REVENTION

January 2, 2018

MEMORANDUM

SUBJECT: Review of range-finder test for an acute *Daphnia magna* toxicity test with NSPW-L30SS

PC Code: 072599	DP Barcode: 444491
Decision No.:	Registration Nos.: 84610-E
Petition No(s).: N/A	Regulatory Action:
Risk Assessment Type: N/A	Case No.: N/A
TXR No.: N/A	CAS No.:
MRID Nos.: 50425701	40 CFR: None

FROM: Donna M. Randall, Senior Biologist
Andrew Byro, Ph.D., Chemist
Risk Assessment and Science Support Branch
Antimicrobials Division (7510P)

THRU: Geoffrey Sinclair, Ph.D., Acting Senior Interdisciplinary Scientist
Laura Parsons, Acting Branch Chief
Risk Assessment and Science Support Branch
Antimicrobials Division (7510P)

TO: Aline Hefferman, Risk Manager
Zeno Bain, Product Manager
John Hebert, Branch Chief
Regulatory Management Branch I
Antimicrobials Division (7510P)

Poly-Technical Solutions submitted a range-finder test for a *Daphnia magna* 48-Hour Acute Toxicity Test with NSPW-L30SS, conducted by STILLMEADOW, Incorporation (MRID 50425701), for Agency review. The request for Agency review of the range-finder test arose from questions during a November 11, 2017 teleconference meeting with Poly-Technical Solutions and its representatives regarding which analytical methods and sensitivity would be appropriate for a *D. magna* 48-hour definitive study using NSPW-L30SS. While several of the range-finder test exposure conditions and monitoring differ from those required for an acceptable definitive test, they are appropriate for a range-finder test. From the range-finder nominal

results, analytical methods able to quantitate ionic silver, dissolved silver, total silver of approximately 0.1 to 0.5 ppb are needed for both the NSPW-L30SS and silver nitrate monitoring (e.g., 48-hr EC_{50} of 550 ppb NSPW-L30SS [5.5 ppb total silver] on a nominal basis and a NOEC of 100 ppb NSPW-L30SS [1 ppb total silver] on a nominal basis) in a definitive test. The reviewers' response on method sensitivity assumes that any renewal of dosed test medium that may be needed in the definitive test does not result in lowering of the nominal endpoint values substantially. The range-finder test was conducted as a static test, and there is insufficient monitoring in the range-finder test or from other testing reported in the range-finder report to determine if renewal is or is not required in the definitive test. Optical methods for monitoring particles would need to be able to detect the number of particles that this equates to in terms of amorphous-silica nanoparticles as though all silver NPs were bound. These reviewers had insufficient information on number of amorphous-silica particles or silver nanoparticles to perform this estimate.

The Agency understands that detection limits in the sub-ppb range and distinguishing between total, nano, and ionic silver is difficult. The Agency recommends the following methods, detailed further in the relevant references[1,2,3]:

1. Filtration of solution through a protein concentration centrifuge filter. A 3 KDa centrifuge filter is designed for concentrating proteins ~ 1 nm or larger. This will allow silver ions to pass through but will prevent the nanoparticles from passing through.
2. Silver ions in the filtered solution may be detectable by either a sufficiently sensitive Selective Ion Electrode or via Ion Chromatography.
3. Unfiltered solution may be tested for total silver via ICP-OES.
4. The nanoparticles filtered of the silver ions may be measured via ICP-MS.

It is understood that these measurements will be at the bottom end of measurability via these methods. As such, the Agency recommends:

1. Running a combination of positive controls at or below the expected concentration.
2. Running spiked samples.
3. A calibration curve in the same range being measured with five data points proving the linearity (assuming the readings are linear at this level).
4. Sufficient readings to derive a standard deviation.
5. Signal-to-Noise Ratio should be above 3:1.

By taking these precautions, even if direct measurements may not be possible, there may be enough data to reasonably infer the necessary data.

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[1] Quadros, M.; Pierson, R.; Tulve, N.; Willis, R.; Rogers, K.; Thomas, T.; Marr, L. Release of Silver from Nanotechnology-Based Consumer Products for Children. *Env. Sci. Tech.*, 2013, *47*, 8894-8901.

[2] Tulve, N.; Stefaniak, A.; Vance, M.; Rogers, K.; Mwilu, S.; LeBouf, R.; Schwegler-Berry, D.; Willis, R.; Thomas, T.; Marr, L. Characterization of Silver Nanoparticles in Selected Consumer Products and its Relevance for Predicting Children's Potential Exposures. *Int. J. Hyg. Env. Sci.*, 2015, *218*, 345-357.

[3] Rogers, K.; Navratilova, J.; Stefaniak, A.; Bowers, L.; Knepp, A.; Al-Abed, S.; Potter, P.; Gitipour, A.; Radwan, I.; Nelson, C.; Bradham, K. Characterization of Engineered Nanoparticles in Commercially Available Spray Disinfectant Products Advertised to Contain Colloidal Silver. *Sci. Tot. Env.*, 2018, *619-620*, 1375-1384.